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TECHNICAL MEMORANDUM

FINDING OF NO EVIDENCE OF TRAVEL DEMAND IMPACT OF GRADE SEPARATIONS

May 23, 2007 By Tom Murtha

A. Introduction and Summary of Findings

This memo is in response to questions about whether railroad grade separations should be included in regional travel demand analyses used for air quality conformity. Railroad grade separations reduce vehicle delayⁱ and improve system reliability, so, assuming fixed travel demand, they are air quality beneficial. However, it was not known whether there would be an offsetting increase in vehicle miles traveled at grade-separated crossings caused by route choice changes that might offset the reduced delay.

A comparison of travel demand model volumes to actual traffic volumes for 99 west suburban railroad crossings showed no significant difference in the models' forecasts for grade-separated and at-grade crossings. Thus, the travel demand models of the Chicago Metropolitan Agency for Planning (CMAP) offer no evidence of a travel demand impact of grade-separating rail crossings. Either no behavior change takes place, or the behavior change is too small to be detectable by the CMAP travel demand models.

B. Statement of Problem

CMAP staff sought to determine whether it is appropriate to modify travel demand models to account for at-grade rail crossings by adding impedance to the models' highway network links at such crossings. Questions had arisen as to whether transportation conformity regulations required that CMAP account for grade separation projects in estimating air quality impacts of transportation projects. Staff also wanted to know whether, aside from regulations, the travel demand models could be improved by accounting for delay at grade crossings. CMAP analyzed data to help address these questions.

C. Analysis Procedures

CMAP tested the hypothesis that, because the travel demand models did not now include any effect for at-grade crossings, the difference between actual and modeled volumes would be greater for separated crossings than for at-grade crossings. If this hypothesis were true, people would be shown to travel further to avoid at-grade crossings.

To test this hypothesis, CMAP collected data for two screenlines. The screenlines were 1) the Union Pacific-West Line from the Kane/DeKalb county line to Oak Park and 2) the Burlington Northern Santa Fe railroad from the Kane/DeKalb county line to Cicero. Both of these screen

lines have very heavy freight and commuter traffic, with substantial route choice available involving both at-grade and grade separated crossings. Staff chose these screenlines because, if there were a travel demand/route choice impact of grade separations, it would likely be evident on such lines with heavy traffic and various alternate routes.

Information collected for the screenline included accumulated daily traffic volumes for the 2007 scenario of the most recent conformity networks, and the most recent Average Annual Daily Traffic (AADT) for the corresponding links. Missing values (roads not in travel demand networks, roads not counted for AADT purposes) were not included in the analysis, and are generally low-volume local roads and streets with at-grade crossings. Ninety-nine crossings had usable data. Of these, sixty-one were at-grade; thirty-eight crossings were grade-separated.

For each usable datapoint, the AADT was subtracted from the modeled daily accumulated traffic (again, the hypothesis concerns the predictive capability of the travel models, not the validity of the modeled volumes themselves). These differences were then analyzed for atgrade and grade-separated crossings.

D. Analysis Results

Summary data from the analysis is shown in the table below:

Analysis of At-Grade versus Grade-Separated Arterial Highway Rail Crossings Model Output Traffic Volume Less Average Annual Daily Traffic

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	At-Grade Crossings	Grade-Separated Crossings
Average Difference	4,661	4,303
Range of Differences:		
High	30,519	33,401
Low	(10,488)	(16,242)
Median	2,179	3,045
Number of Crossings	61	38

The average differences were compared, but were not found to be different at the 95% confidence level (t=0.2, df = 97). Thus, whether a railroad crossing is at-grade or grade separated is not shown to explain any of the differences between actual and forecast volumes on arterial roads.

E. Finding

Principal Finding: Based on these results, adding additional impedance to account for at-grade crossings would not add to the usefulness or analytic capability of the CMAP travel demand models. Either there is no change in behavior resulting from at-grade crossings or the impact is so small as to be undetectable by regional travel demand models.

Secondary Finding: Thus, this analysis does not support an argument that arterial highway grade separation projects should be included in regional highway networks used for conformity purposes.

Notes

¹ The amount of time per day an at-grade railroad crossing is closed at busy crossings is comparable to the red phase of a highway traffic signal over the period of a day, though the characteristics of highway traffic signals and at-grade railroad crossings otherwise differ.

ⁱⁱ The CMAP travel demand models' highway network records now include a field to mark at-grade crossings. This field is set to "0" for all links except at-grade crossings, which are marked "1." Grade separation projects are coded in highway networks by changing this field value from "1" to "0." However, travel forecast procedures do not now use this data.

Transportation conformity regulations assure that transportation plans and programs do not hinder achievement of National Ambient Air Quality Standards (NAAQS). Analytic procedures are established to determine the impact of transportation projects on emissions using travel demand models. The regulations (40 CFR 93.126) include "railroad highway crossing" as a category of safety projects exempt from the requirements to determine conformity. The consultation process that guides transportation conformity in metropolitan Chicago had interpreted grade separations as not fitting into this "safety" category, which was thought to mean improvements like better crossing surfaces and warning devices at grade crossings. However, special procedures were established for expediting some non-exempt projects, including railroad grade separations. At a recent consultation team meeting, some participants suggested that grade separations should simply be categorized as exempt, including them within the meaning of "railroad highway crossing" in safety projects exempt from conformity, but no consensus was reached.

iv http://www.gettingaroundillinois.com/default.aspx?ql=aadt